CMS Installation and Commissioning

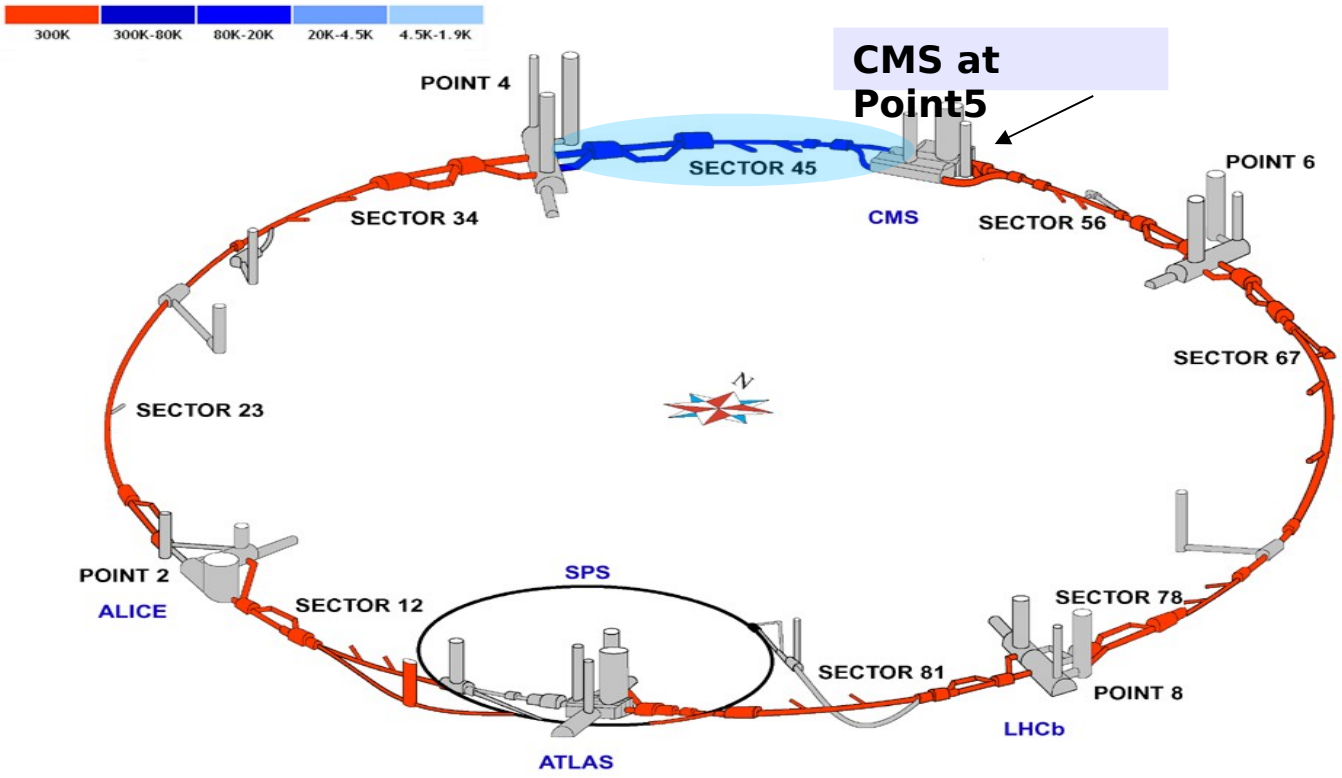
All Experimenters' Meeting

November 12, 2007

Kaori Maeshima

LHC – Cooldown in Progress

- **Design: 1232 superconducting 8.4T dipole magnets at T=1.9K**
- **Currently, Cooldown at sector 45 to T=4.5K (water contamination found and fixed last week).**



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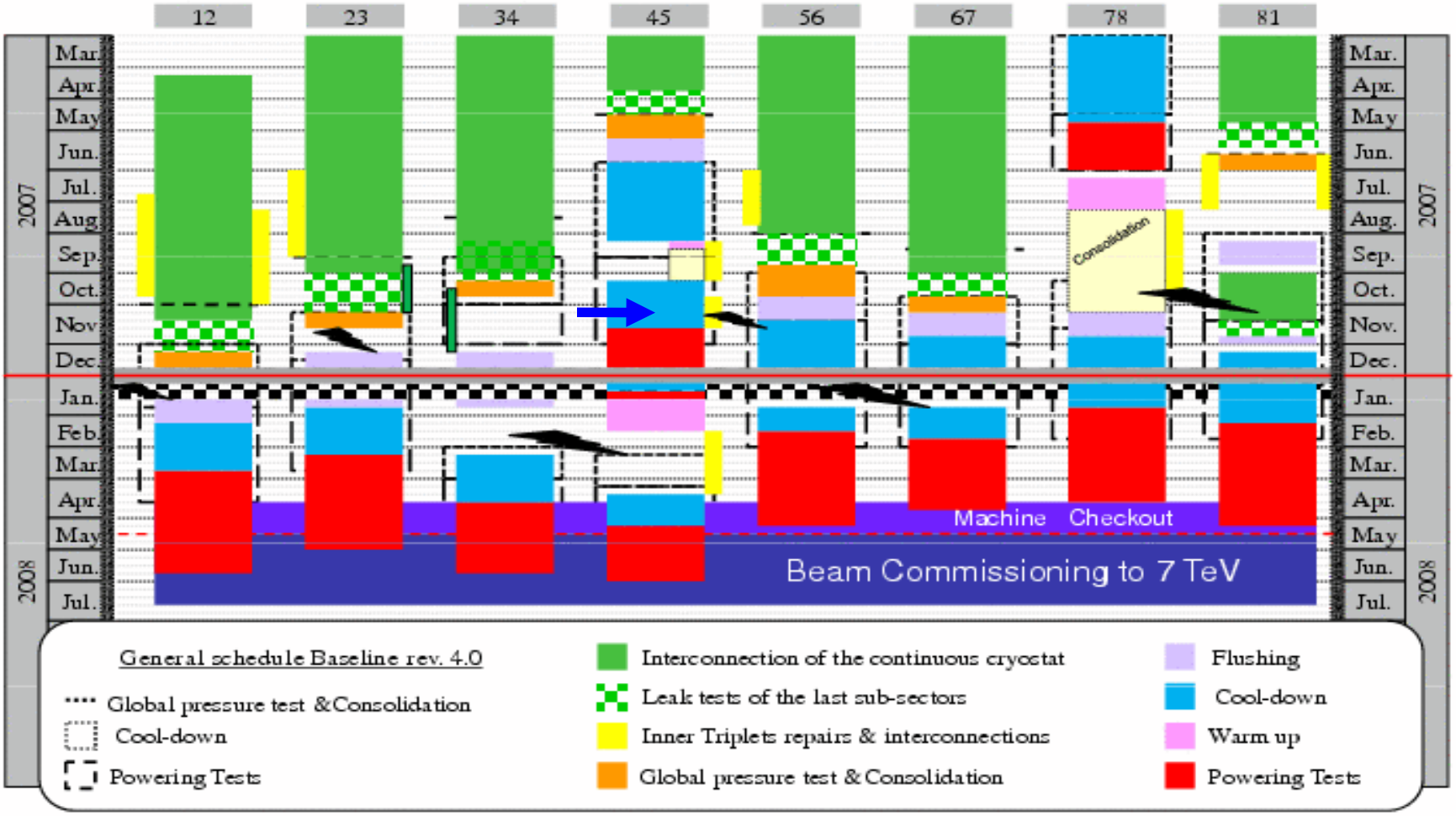
LHC General Coordination Schedule

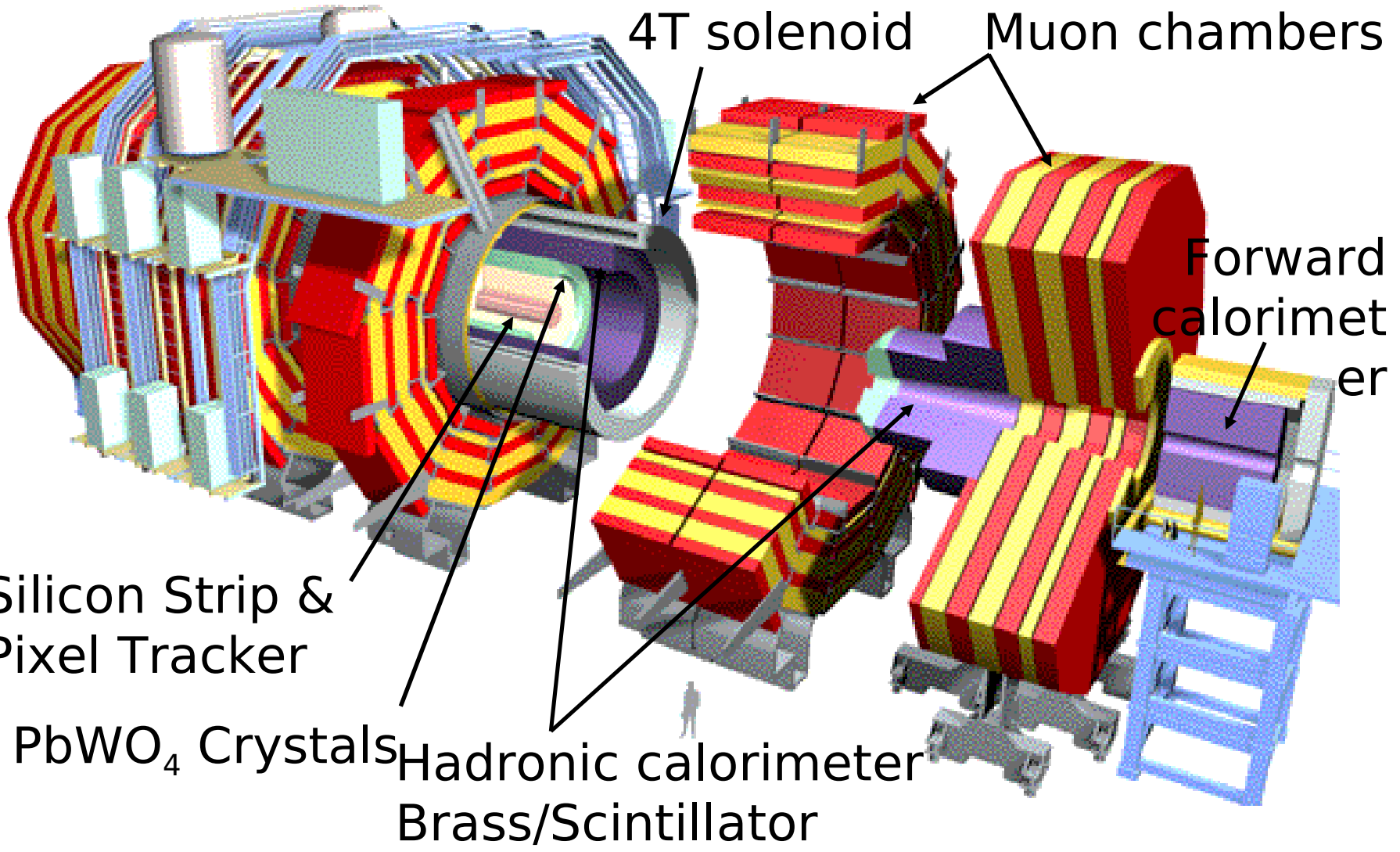
- **Official Schedule: Beam in summer 2008**
- **Time [warmup-cooldown] is "months" not "weeks"**



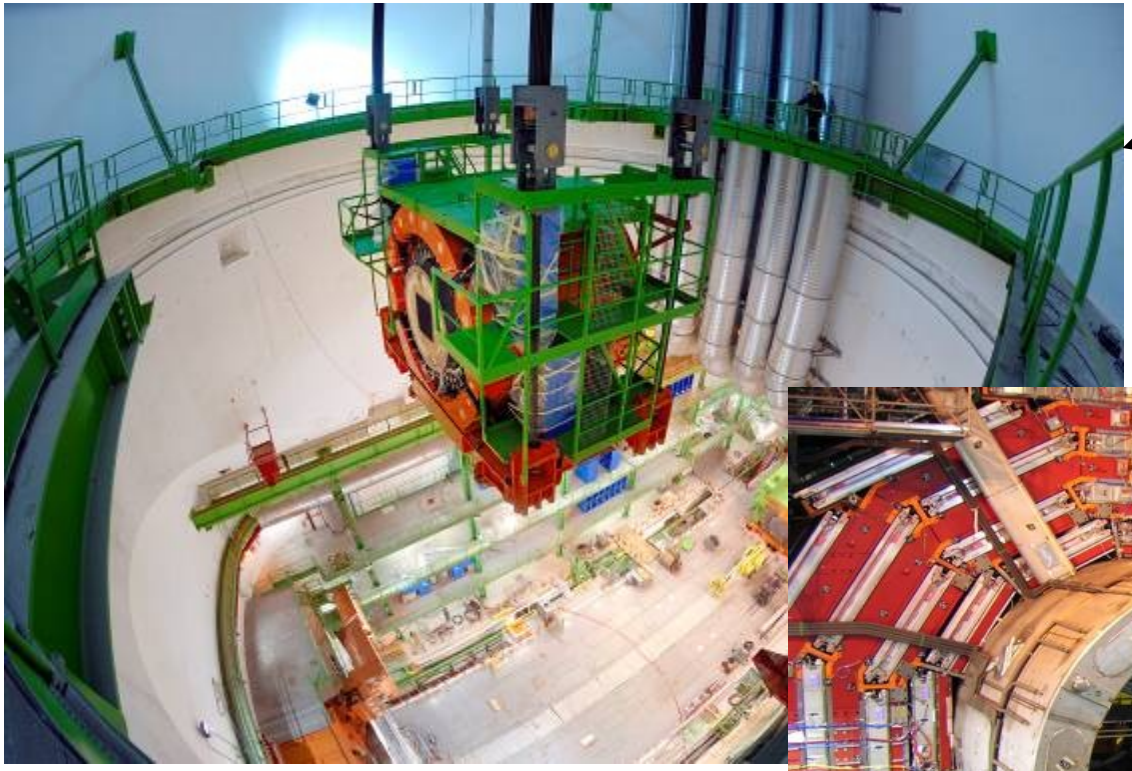
CMS Installation - Challenge

- **Due to the late readiness of the experimentel hall at P5, everything must be lowered/installed in ~ 1 year. (very different in case of ATLAS).**
- **Magnet and detectors were assembled & tested (MTCC) in 2006 upstiars.**
- **Despite very tight time constraint, most of the detector components are downstairs now (UX5) and the heavy lowering is planed to be completed in Jan. 2008.**

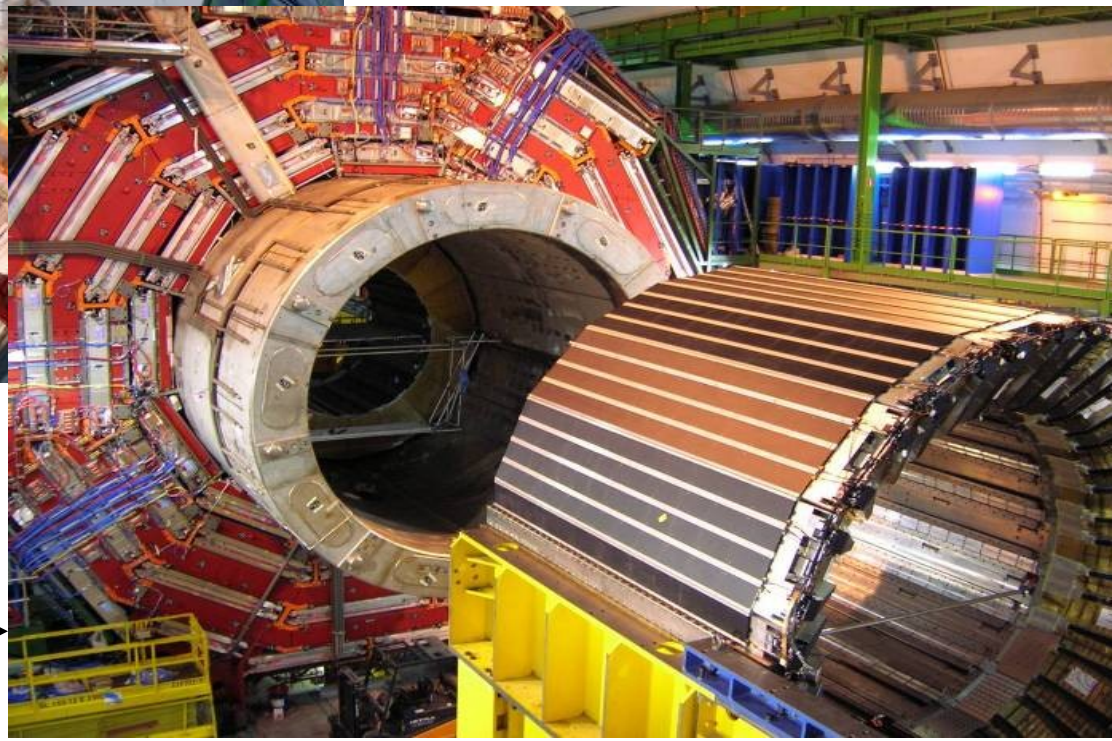
The Compact Muon Solenoid Experiment



Lowering of HF and HB insertion



Lowering of the Hadron Forward Calorimeter (HF), Nov. 2, 2006



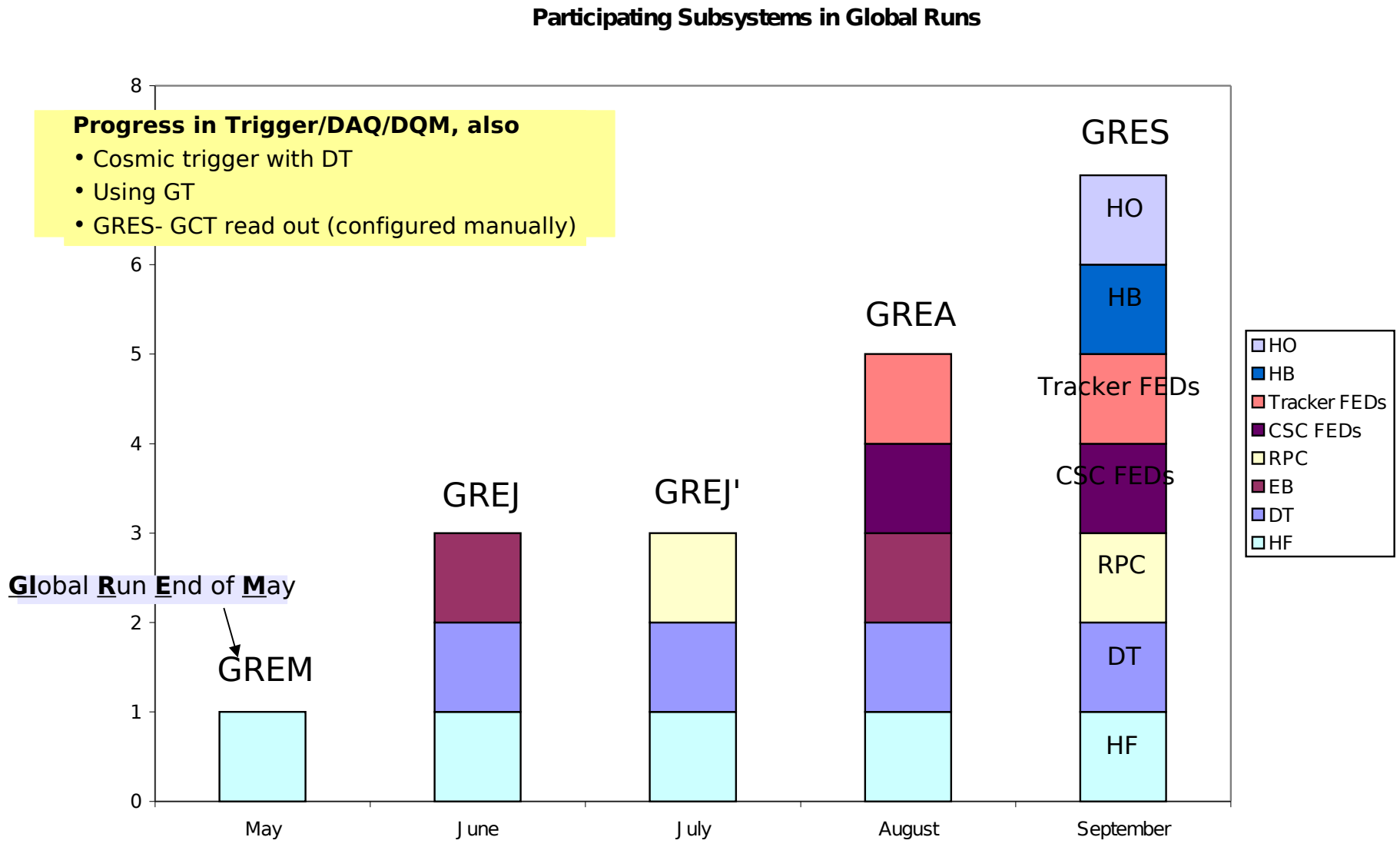
Insertion of Hadron Barrel Calorimeter into the Central wheel (YB0) and magnet structure (2000 ton)
March, 2007

CMS Installation/Commissioning Status: Overview

- **Most of the heavy components have been lowered.**
- **What parts are left: Tracker and YE -1, -2 and -3.**
  - **Tracker likely to be lowered in December.**
  - **Lowering should complete in Jan. 2008.**
- **UXC: YB0 Services**: **A large collective effort at Pt 5** . Tracker pre-services (piping, insulation, LV cabling and testing completed), HB services completed and commissioned, EB services in full swing but has taken significantly longer than expected. Much reinforcement over the last week or so.
- **Consolidation work on plus-end.** YB0 DTs all readout for the first time
- **USC: All magnet ancillaries lowered & re-installed**. Pumped, cooldown can start in mid-Nov.
- **Commissioning runs ongoing.**

→ **End of Month Global Runs..... (since May 2007)**

Increasing Complexity of the 2007 Global Runs

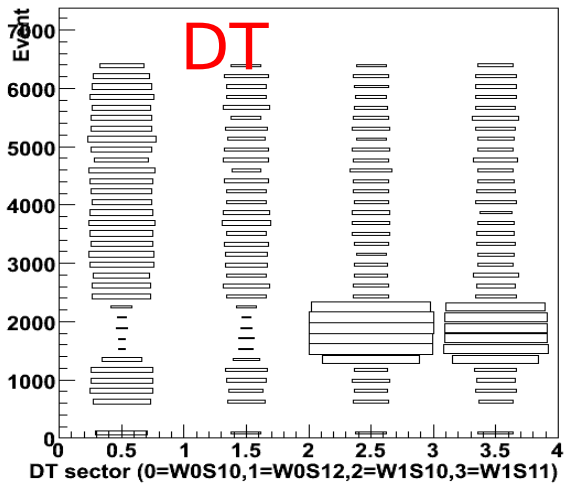


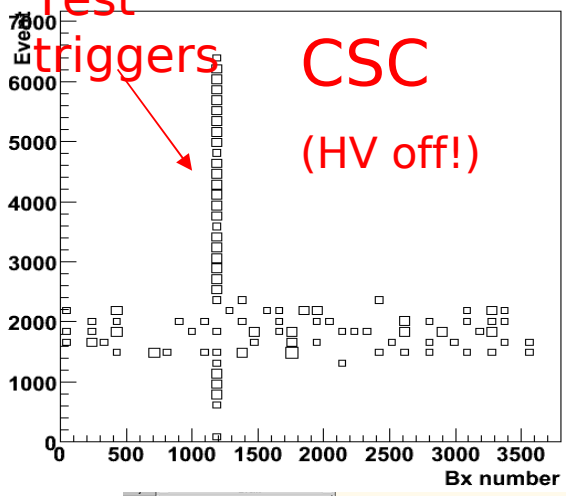
GRES Summary, GREN Preparation

- **GRES Concluded (Sept. 26 – 28)**
  - Ran 7HB wedges, 3 HO sectors, 4 DT sectors, 4 RPC sectors and CSC and Tracker FEDs
  - Data (~5GB) taken and shipped to T1-FNAL and T2-Florida, T2-MIT, as well as the CAF
  - Analysis of GRES data started show important findings which could not be found looking at MC data (noise, alignments of tracker & muon chambers, timing, etc...)

- **Next global run is GREN (Nov. 26 – Dec. 7)**
  - up to the September Global Runs, duration of actual running time of GR was ~ 2 – 3 days (weekday only, ~10h/day type operation).
  - GREN is 2 weeks. We plan to have steady data taking between Nov. 30 and Dec. 7, 24h/day operation.
  - Plan to collect large number of cosmic events, and exercise the system not just at Point5, but through the chain of data reconstruction, data transfer, real time remote monitoring, prompt data analyses.

Correlated DT, CSC Noise



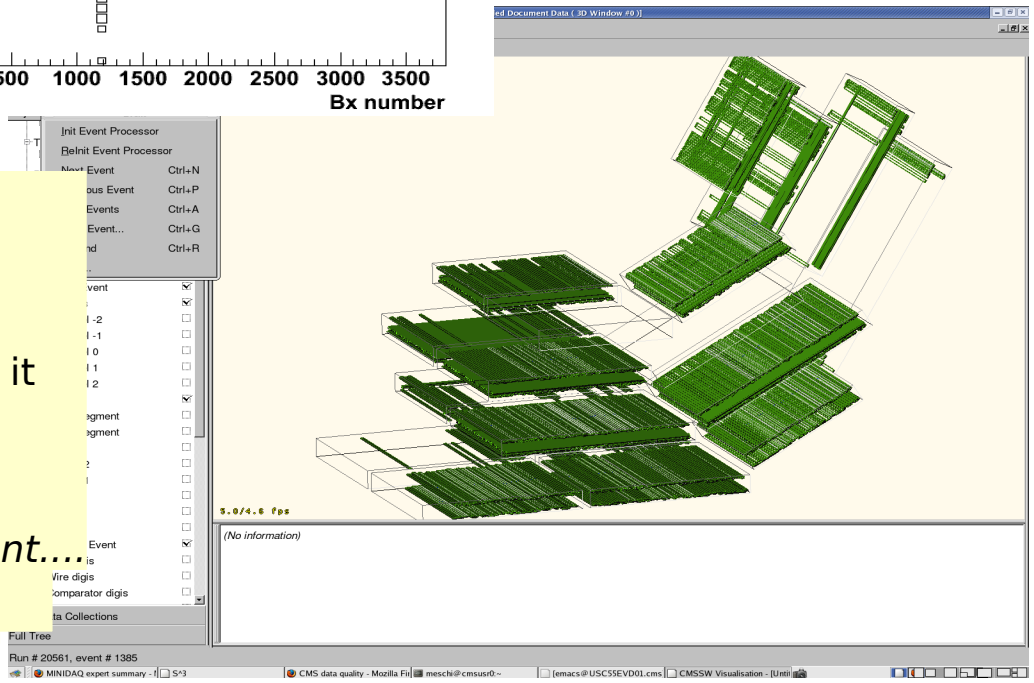


Run 20558

Elog posting by Frank Geurts
Fri Oct 5 12:24:46 Entry time
Subject: CSC/DT Global Noise Run: found it

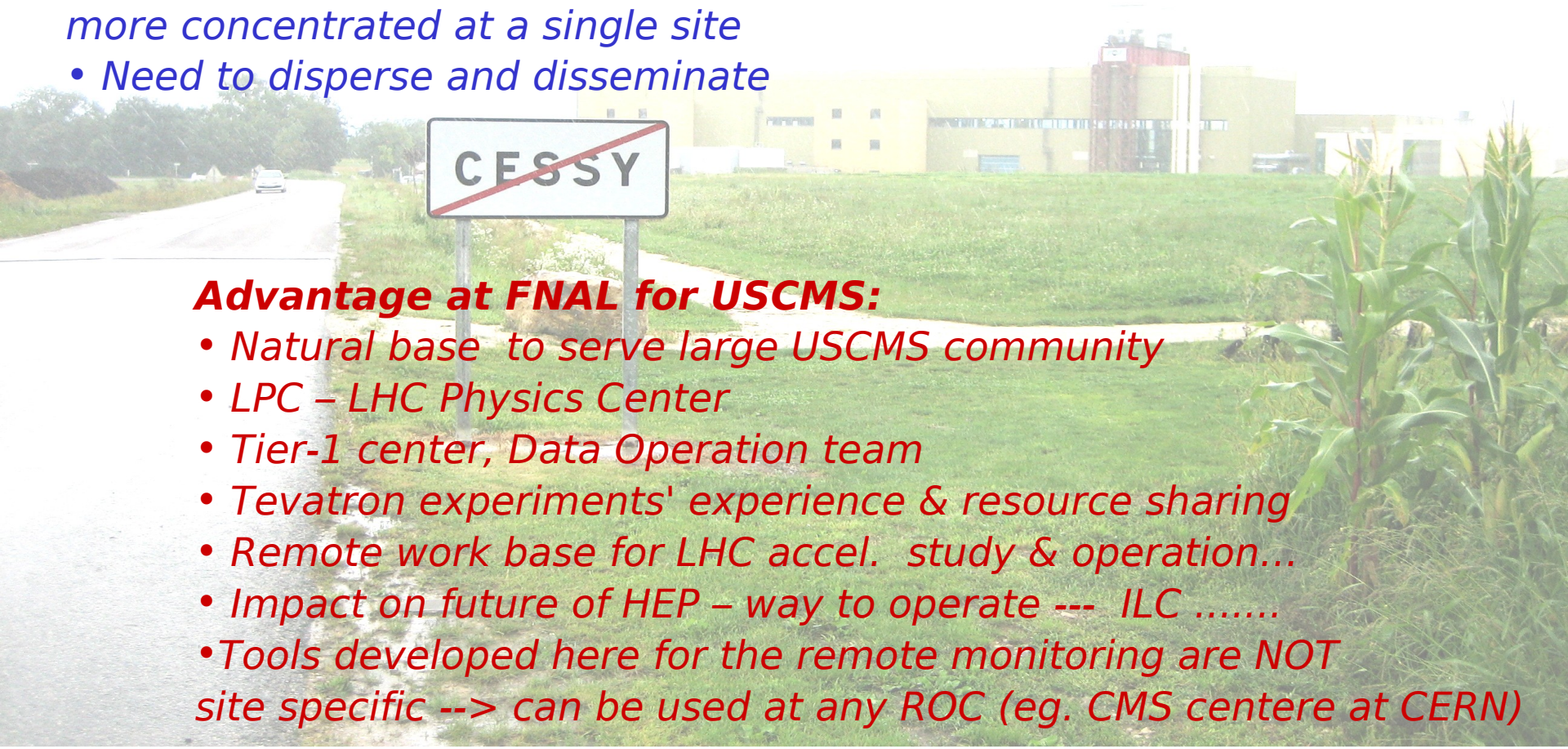
https:/cmsdaq.cern.ch/elog/CSC/2796

..... the major source..: welding equipment....



Why Remote Operation? Why at FNAL?

- *Thousands of collaborators located all over the world*
- *Most of them not resident at CERN*
- *Collider H.E.P. facilities have, however, never been more concentrated at a single site*
- *Need to disperse and disseminate*



Advantage at FNAL for USCMS:

- *Natural base to serve large USCMS community*
- *LPC – LHC Physics Center*
- *Tier-1 center, Data Operation team*
- *Tevatron experiments' experience & resource sharing*
- *Remote work base for LHC accel. study & operation…*
- *Impact on future of HEP – way to operate --- ILC …….*
- *Tools developed here for the remote monitoring are NOT site specific --> can be used at any ROC (eg. CMS centere at CERN)*

ROC mini History

Location: Move to WH1 (LHC@FNAL)

Remote shifts (at FNAL) taken, then already

Tracker integ. test

HCAL Test Beam

2004 | 2005 | 2006 | 2007 | 2008 --

WBM effort continues....

MTCC I,II

DQM work continues ...

Global commissioning run

Construction of WH11NW ROC room

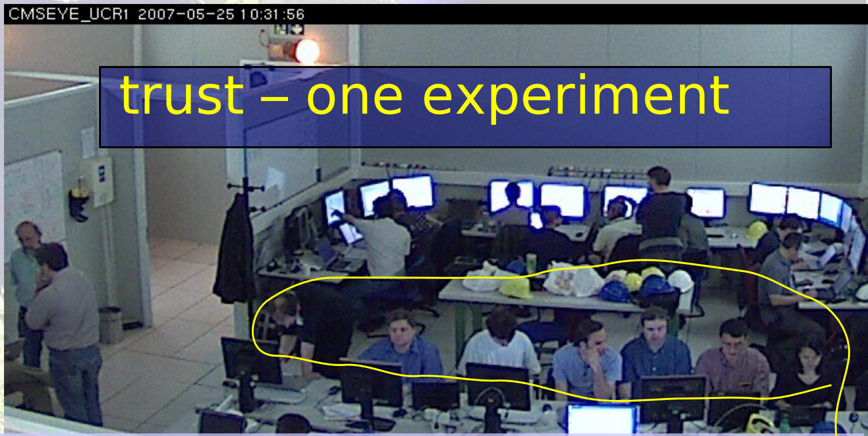
we are here

ROC at CERN (CMS Centre) infrastructure to be completed

LHC @ FNAL Remote Operations Center

Remote Operations

Fermilab Remote Operations Center,
LHC@FNAL



CMS Underground Control Room
2007 MAY Global Integration Run.
There are many of us (USCMS people) in action here and there! It has been agreed that"remote shifts" provide proper service work credit in CMS

FNAL

CERN

technical ground- tool development

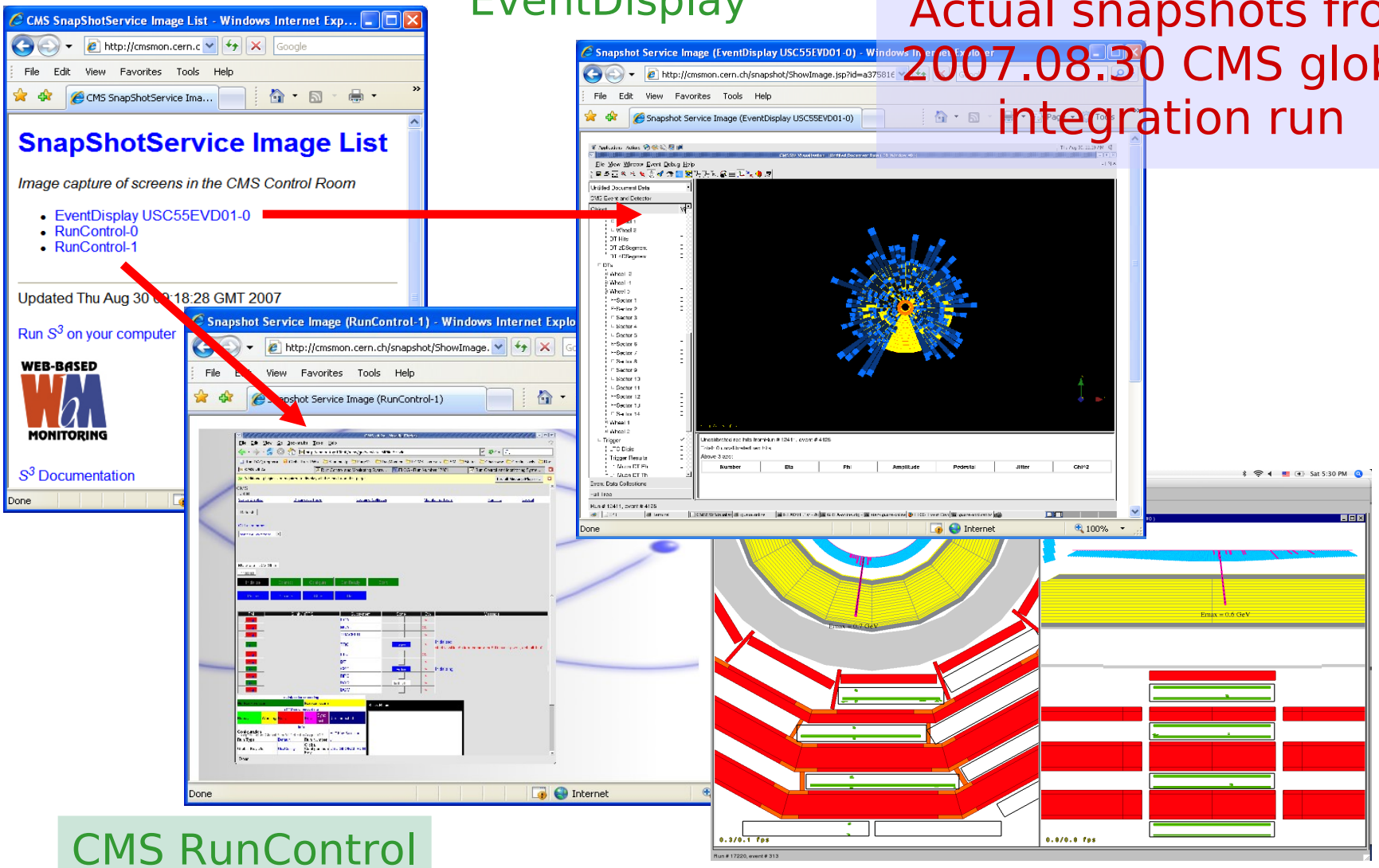
- Tools needed for remote status display (DQM, WBM, S^3, etc...)
- Must be easy to use and flexible, but robust
- Cooperative with firewall, security
- Must survive trans-Atlantic crossing
- Reuse where it make sense: online and offline monitoring

Screen Snapshot Service Example
(tool example)

S^3

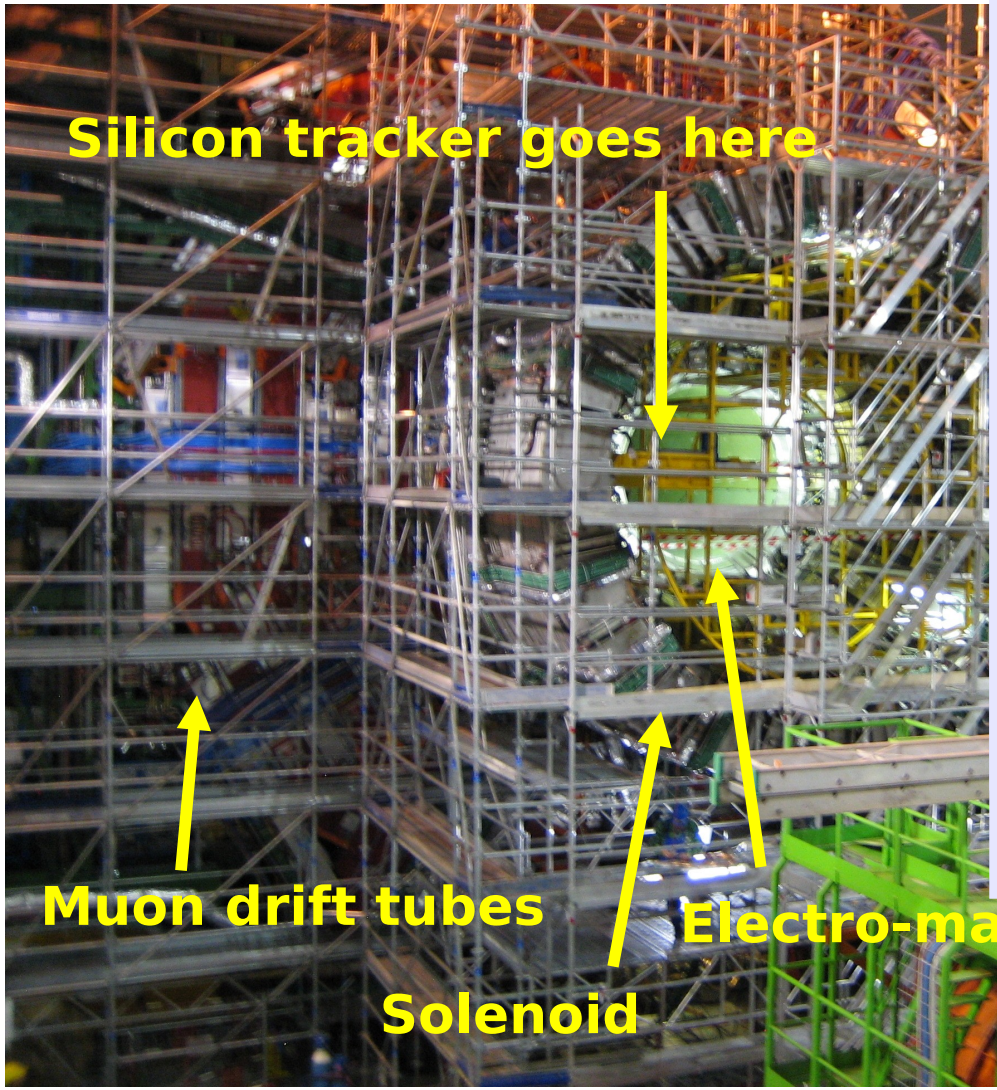
EventDisplay

Actual snapshots from 2007.08.30 CMS global integration run



CMS RunControl

CMS Collision Hall – Busy & Crowded



CMS Collision Hall 2007

summary and plan:

- **Most of the heavy lowering is done. Plan is to finish in Jan. '08**
- **Nov. global run – extended to be two weeks long: Nov. 26 – Dec. 7th**
- **Installation plan: Tracker – this year, Pixel - ~ March 2008.**
- **Cosmic Run (0T) with Tracker to be scheduled early in 2008**
- **In April 2008, Cosmic runs with magnet (3.8T) is planned.**
- **Beam Summer 2008 collisions**
- **Remote Operation in CMS is becoming an integral part of the CMS operation.**